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RESPONSE TRANSMITTAL AND FEE AUTHORIZATION

	ATTORNEY DOCKET NO.: 15162/02100	SERIAL NO.: 09/591,622	
FILING DATE: June 9, 2000	Confirmation No: 3045	EXAMINER: Thomas M. Dougherty	GROUP ART UNIT: 2834
INVENTOR(S): Shinya MATSUDA, et al			
TITLE OF INVENTION: ACTUATOR AND DRIVING METHOD THEREOF			

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
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August 8, 2003
Date of Deposit
DOUGLAS A. SORENSEN
Name of Applicant, Assignee, or Registered Representative

Signature
August 8, 2003
Date of Signature

TRANSMITTED HEREWITH FOR THE ABOVE IDENTIFIED PATENT APPLICATION IS:

- ☐ (A) A response to the Office Action dated:
- ☐ (B) A Petition for Extension of Time
  ☐ for 1 month ☐ for 2 months ☐ for 3 months;
  A Petition for Extension of Time, having been previously filed,
  ☐ for 1 month ☐ for 2 months ☐ for 3 months
- ☐ (C) A request for approval of proposed drawing changes.
- ☐ (D) A Notice of Appeal. $
- ☒ (E) An Appellant's Brief on Appeal. **$320.00**
- ☐ (F) Other: . $
- ☐ (G) A verified statement to establish small entity status under 37 CFR §§ 1.9 and 1.27
- ☐ Small entity status under 37 CFR § 1.27 has been previously established
- ☐ The claims fee, if any, has been calculated as shown below

	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NO. PREVIOUSLY PAID FOR	PRESENT EXTRA
TOTAL		MINUS		
INDEP.		MINUS		
FIRST PRESENTATION OF MULTIPLE DEP. CLAIM				

SMALL ENTITY RATE	SMALL ENTITY ADD'L FEE		LARGE ENTITY RATE	LARGE ENTITY ADD'L FEE
x $9	$	OR	x $18	$
x $42			x $84	
+ $140			+ $280	
TOTAL ADD'L FEE	$ 0.00		TOTAL ADD'L FEE	$ 0.00

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August 8, 2003
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By: ______________________
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application No.:	09/591,622
U.S. Application of:	Shinya MATSUDA, Takashi MATSUO and Masayuki UEYAMA
For:	ACTUATOR AND DRIVING METHOD THEREOF
Confirmation No.:	3045
Customer No.:	24367
Docket No.:	15162/02100
Filed:	June 9, 2000
Group Art Unit:	2834
Examiner:	Thomas M. Dougherty

MAIL STOP APPEAL BRIEF - PATENTS
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313–1450
Dear Sir:

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August 8, 2003
Date of Deposit

Douglas A. Sorensen
Name of Applicant, Assignee, or Registered Representative

Signature

August 8, 2003
Date of Signature

BRIEF FOR APPELLANT

This is an appeal from the Final Rejection dated December 30, 2002, rejecting claims 1 and 5 in the present Application. In addition, claims 3 and 4 are objected to as depending from a rejected claim . A Notice of Appeal was filed on June 20, 2003, resulting in an Appeal Brief due date of August 20, 2003.

This brief is submitted in triplicate.

This brief is accompanied by a Response Transmittal and Fee Authorization, authorizing the requisite fee of $320.00 as set forth in § 1.17(c). In the event that the Response Transmittal and Fee Authorization is not enclosed, please charge any required fee (other than an issue fee) during the pendency of this Application to Sidley Austin Brown & Wood LLP's Deposit Account No. 18-1260. Please credit any excess payment to the same account.

If an extension of time is required to enable this document to be timely filed and there is no separate Petition for Extension of Time filed herewith, this document is to be construed as also constituting a Petition for Extension of Time under 37 CFR § 1.136(a) for a period of time sufficient to enable this document to be timely filed. Any fee required for such Petition for Extension of Time and any other fee required by this document pursuant to 37 CFR §§ 1.16 and 1.17, other than an issue fee, and not submitted herewith should be charged to Sidley Austin Brown & Wood LLP's Deposit Account 18-1260. Any refund should be credited to Deposit Account 18-1260.

REAL PARTY IN INTEREST (37 C.F.R. § 1.192(c)(1))

The real party in interest in the present Application is Minolta Co., Ltd., a corporation of Japan, having an office at Osaka Kokusai Building, 3-13, 2-Chome, Azuchi-Machi, Chuo-Ku, Osaka-Shi, Osaka 541, Japan.

RELATED APPEALS AND INTERFERENCES (37 C.F.R. § 1.192(c)(2))

There are no related appeals or declared interferences which will directly affect or be directly affected by the present Application to the knowledge of the undersigned.

STATUS OF CLAIMS 37 C.F.R. § 1.192(c)(3)

This Application was filed as U.S. Application Serial No. 09/591,622 on June 9, 2000, and claims priority from Japanese Patent Application No. 11-166,919, filed June 14, 1999 and .Patent Application No. 11-185,197 field on June 30, 1999

The Application was filed with seventeen (17) claims. Appellants canceled claim 10 in an amendment filed November 14, 2001. Appellants canceled claim 2 in an amendment filed December 3, 2002. Claims `1, 3-9 and 11-17 stand rejected and are the subject of this appeal. Claims 1, 3-9 and 11-17, a total of 15 claims, are now pending.

The status of the claims is, therefore, believed to be as follows:

Allowed claims:	6-9 and 11-17
Claims objected to:	3 and 4
Claims rejected:	1 and 5

Appellants hereby appeal the Examiner's final rejection of claims 1 and 5 in this matter which presently stand rejected over the cited references of record.

Claims 1, 3-9 and 11-17, as amended, are set forth in Appendix A (attached hereto) pursuant to 37 C.F.R. § 1.192(c)(9).

STATUS OF AMENDMENTS (37 C.F.R. § 1.192(c)(4))

No amendments were filed by Appellants in their Response filed on April 28, 2003 to the Final Office Action dated December 30, 2002. Therefore, there are no outstanding amendments that have not been entered.

SUMMARY OF INVENTION (37 C.F.R. § 1.192(c)(5))

The present invention relates to an actuator and a method for driving that actuator. The piezoelectric devices 10 and 10' (Figure 3) of the actuator consist of a plurality of piezoelectric plates 11 disposed between electrodes 12 and 13. The orientation of the peizoelectric plates and the electrodes are alternated so that a voltage applied to between electrodes 12 and 13 will cause all of the plates in that piezoelectric device to either expand or contract. As shown in Figure 3, the piezoelectric devices are positioned at a right angle relative to each other. At the apex of the right angle, a chip member 20 provides the driving motion from the piezoelectric devices to a rotor 40. A base member 30 holds the opposite ends of the piezoelectric devices in position.

When alternating current driving signals having a selected phase are applied to the piezoelectric devices, the chip member 20 can be driven in a circular or elliptic motion, thus imparting a directional drive to rotor 40. Of importance, each of the piezoelectric devices 10 has a resonance frequency at which maximum displacement of the device is achieved. However, when connected as in Figure 3, the operation of the opposing device will interfere with the driving of the device (page 13, line 21 – page 14, line 17). In the prior art, this problem was solved by devices that ensure the the two piezoelectric devices vibrate independently (page 14, line 18-24). In the present invention, however, the piezoelectric devices are specifically designed so that resonant frequency of the actuator when the devices are driven in phase coincides with the resonant frequency of the actuator when the devices are driven in the reverse phase mode (*i.e.* the signal applied to the second device is reverse phase of the signal applied to the first device). The necessary conditions for these resonant frequecies to coincide is described at page 17, line 9 – page 27, line 21. When these resonant frequencies coincide, a substantially circular motion can be achieved without additional devices to ensure independent vibration of the piezoelectric devices (page 15, line 12 – page 17, line 5).

ISSUES PRESENTED FOR REVIEW (37 C.F.R. § 1.192(c)(6))

Issue No. 1: Claims 1 and 5 are rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Patent No. 5,563,465 to Nakahara et al ("Nakahara"). Thus, the issue is whether the teachings of this references show, expressly or inherently, all of the limitations of the claims.

Issue No. 2: Claim 1 is rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Japanese Publication No. 53-82286 to Takekida ("Takekida") in view of Nakahara. Thus, the issue is whether the teachings of these references disclose or suggest all of the limitations of the claims to establish a *prima facie* case of obviousness.

GROUPING OF CLAIMS (37 C.F.R. § 1.192(c)(7))

In regard to Issues No. 1 and 2 above, in order to make the appeal process as efficient as possible and for the purposes of this Appeal only, Appellants agree to have the claims 1 and 5 considered as one group. Thus, claims 1 and 5 stand or fall together.

ARGUMENT (37 C.F.R. § 1.192(c)(8))

As this Appeal concerns rejections only under 35 U.S.C. §§102 and 103, this section includes only arguments pursuant to 37 C.F.R. § 1.192(c)(8)(iii) and 37 C.F.R. § 1.192(c)(8)(iv).

A. Cited References

The Examiner relied upon two references in the Final Office Action: Nakahara and Takekida. In order to avoid undue repetition of background information and needless restatements as to the subject matter of this reference, a discussion of the references is provided here.

For each respective discussion of the above reference in view of the aforesaid issue, a shorter treatment of the appropriate references shall be provided. Where appropriate, the reader will be referred back to this section to review a reference, if necessary.

1. <u>The Nakahara Patent</u>

Nakahara shows a piezoelectric actuator. Two piezoelectric devices 1 and 2 are supported at one end by a base 5. At the other end of the piezoelectric devices is a drive head 3, which places the piezoelectric devices 1 and 2 at a 90° relationshsip. A plurality of drive signals are applied to the piezoelectric devices (Figures 1(b) and 5-7). As a result, the drive head 3 may be moved in an elliptical orbit. (Fig. 2, col. 1, lines 14-30.)

2. <u>The Takekida Publication</u>

Takekida shows two piezoelectric devices 4a and 4b positioned at 90° and connected by a connecting device 5 for driving a rotor 2. There is no evidence in the record that discusses resonant vibration at all.

B. <u>Issue One</u>

Claims 1 and 5 stand rejected under 35 U.S.C. § 102(b) as being unpatentable over Nakahara.

In contrast to the cited prior art, Claim 1 includes an actuator:

> wherein the displacing devices have a first natural frequency in a first natural vibration mode, in which the displacing devices are resonantly vibrated in the same phase, that substantially coincides with a second natural frequency in a second natural vibration mode, in which the displacing devices are resonantly vibrated in the opposite phase.

The rejection states that the "[r]ecitation of the natural frequency of the displacing devices in a first natural vibration mode and a second natural vibration is regarded as a goal of the invention. As this description provides for no further structural limitation to the structure

of claim 1, it is regarded as a goal of the invention but not carrying patentable weight." This statement misstates both the quoted limitation and legal effect of the limitation.

The quoted limitation of claim 1 states that the "**displacing devices have** a first natural frequency ... **that substantially coincides** with a second natural frequency ... ." Thus the first natural frequency in the first mode and the second natural frequency in a second mode must substantially coincide. That is not a goal. That is a specific physical limitation of claim 1. As stated in MPEP §2106 (II)(C):

> The subject matter of a properly construed claim is defined by the terms that limit its scope. It is this subject matter that must be examined. As a general matter, the grammar and intended meaning of terms used in a claim will dictate whether the language limits the claim scope. Language that suggests or makes optional but does not require steps to be performed or does not limit a claim to a particular structure does not limit the scope of a claim or claim limitation.

The quoted limitation from claim 1 does not suggest. It states that the displacing devices must have a physical property. As such, it provides a specific physical limitation. Thus, the quoted portion of the claim cannot be ignored because every limitation of a claim must be shown in the reference, expressly or inherently, to make a case for anticipation. MPEP §2131.

Appellants' specification provides ten pages (pp. 17-27) of detail on how the relative characteristics of the displacing devices, compounding members, etc. must be combined to provide "a first natural frequency in a first natural vibration mode ...that substantially coincides with a second natural frequency in a second natural vibration mode." Nakahara only discusses the resonant frequencies in terms of given characteristics and limitations on operation (column 2, lines 25-43). There is no suggestion in the cited reference of any method to tailor the resonant frequencies of the acutator in different drive modes, much less to tailor the resonant frequencies in different modes to "substantially coincide." Thus, the cited reference does not show, expressly or inherently, every limitation of claim 1 and thus does not anticipate claim 1. Claim 5 is dependent upon

claim 1, and thus includes every limitation of claim1. Therefore, claim 5 is also not anticipated.

C. Issue Two

Claim 1 stands rejected under 35 U.S.C. § 103(a), as allegedly being unpatentable over Takekida in view of Nakahara.

As with Nakahara, Takekida does not show or suggest an actuator having "a first natural frequency ... that substantially coincides with a second natural frequency ... ." There is no evidence in the record that indicates the Takekida discusses resonant frequencies at all. To provide a *prima facie* case for obviousness, the combined references must show or suggest every limitation of the claim. MPEP 2143.03. None of the cited references shows or suggests the above quoted limitation of claim 1. Therefore, claim 1 is not obvious over the cited references.

D. Conclusion

In view of the foregoing, no case for anticipation nor a *prima facie* case of obviousness has been established with regard to either of Claims 1 and 5. Accordingly, the Appellant respectfully requests the Board of Patent Appeals and Interferences to reverse the Examiner's rejections as to all of the appealed claims.

Respectfully submitted,

By: ______________________

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APPENDIX A

(37 C.F.R. § 1.192(C)(9))

1. (Previously Presented) An actuator comprising:

a plurality of displacing devices for generating displacements;

a compound member, connected to the displacing devices, for compounding displacements of the displacing devices;

a base member for holding base ends of the displacing devices to which the compound member is not connected;

a pressing member for pressing the compound member to an object to be driven; and

a driver for resonantly driving the displacing devices so as to move the compound member along an elliptic or a circular trail;

wherein the displacing devices have a first natural frequency in a first natural vibration mode, in which the displacing devices are resonantly vibrated in the same phase, that substantially coincides with a second natural frequency in a second natural vibration mode, in which the displacing devices are resonantly vibrated in the opposite phase.

2. (Canceled)

3. (Previously Presented) An actuator in accordance with claim 1, wherein a mass of the compound member is designated by a symbol "M", a length of each displacing device is designated by a symbol "L", a height of each displacing device is designated by a symbol "H", and a mass of each displacing device is designated by a symbol "m", and the equation

$$M=(L^2/H^2-0.88)m/2.63$$

is satisfied.

4. (Previously Presented) An actuator in accordance with claim 1, wherein a mass of the compound member is designated by a symbol "M_c", a mass of each displacing device is designated by a symbol "m", a spring constant of each displacing

device in the expansive deformation is designated by a symbol "k_1", a spring constant of each displacing device in the bending deformation is designated by a symbol "k_3", a moment of inertia of the base member is designated by a symbol "I_z", a rotation radius of the base member is designated by a symbol "R", and an equivalent mass of the base member converted to a cantilever is designated by a symbol "M_b'", and the equations

$$(k_1/(1-p))/(M_c+(1-p)m/3)=(k_1/(1-q)+k_3)/(M_c+(1-q)m/3+m/2)$$

$$p=(M_c+m/3)/(M_c+I_z/R^2+2m/3)$$

$$q=(M_c+5m/6)/(M_c+M_b'+7m/6)$$

are satisfied.

5. (Previously Presented) An actuator in accordance with claim 1, wherein at least one of the plurality of displacing devices includes an elastic member as a part thereof.

6. (Previously Presented) An actuator comprising:

a first displacing device;

a second displacing device;

a compound member connected to top ends of the first displacing device and the second displacing device and for compounding displacements of the first displacing device and the second displacing device; and

a driver for resonantly driving the displacing devices so as to move the compound member along an elliptic or a circular trail,

wherein the driver drives the first displacing device and the second displacing device by driving signals respectively having a frequency that is between a first frequency and a second frequency,

wherein the first frequency is a higher one of a resonant frequency of the first displacing device and a resonant frequency of the second displacing device, and

wherein the second frequency is a lower one of an antiresonant frequency of the first displacing device and an antiresonant frequency of the second displacing device.

7. (Previously Presented) An actuator comprising:

a first displacing device;

a second displacing device;

a compound member connected to top ends of the first displacing device and the second displacing device and for compounding displacements of the first displacing device and the second displacing device; and

a driver for resonantly driving the displacing devices so as to move the compound member along an elliptic or a circular trail,

wherein the driver drives the first displacing device and the second displacing device by using a first displacing device driving signal and a second displacing device driving signal, respectively, each of the driving signals having a frequency included in an overlapped region of a first frequency band and a second frequency band,

wherein the first frequency band is defined as a region between a resonance frequency of the first displacing device and an antiresonance frequency of the first displacing device in which a phase difference between a phase of a voltage of the first displacing device driving signal and a phase of a current flowing in the first displacing device is substantially constant,

wherein the second frequency band is defined as a region between a resonance frequency of the second displacing device and an antiresonance frequency of the second displacing device in which a phase difference between a phase of a voltage of the second displacing device driving signal and a phase of a current flowing in the second displacing device is substantially constant,

wherein the frequency of the driving signals is a value at the center between a first frequency and a second frequency,

wherein the first frequency is a smaller one of the resonance frequencies of the first displacing device and the second displacing device, and

wherein the second frequency is a smaller one of the antiresonance frequencies of the first displacing device and the second displacing device.

8. (Previously Presented) An actuator in accordance with claim 6, wherein the phase of the driving signal for driving the first displacing device has a phase difference with respect to the driving signal for driving the second displacing device.

9. (Previously Presented) An actuator comprising:

a first displacing device;

a second displacing device;

a compound member connected to top ends of the first displacing device and the second displacing device and for compounding displacements of the first displacing device and the second displacing device;

a driver for resonantly driving the displacing devices so as to move the compound member along an elliptic or a circular trail, and

current sensors respectively for sensing currents flowing in the first displacing device and the second displacing device,

wherein the driver drives the first displacing device and the second displacing device by using a first displacing device driving signal and a second displacing device driving signal, respectively, each of the driving signals having a frequency included in an overlapped region of a first frequency band and a second frequency band,

wherein the first frequency band is defined as a region between a resonance frequency of the first displacing device and an antiresonance frequency of the first displacing device in which a phase difference between a phase of a voltage of the first displacing device driving signal and a phase of a current flowing in the first displacing device is substantially constant, and

wherein the second frequency band is defined as a region between a resonance frequency of the second displacing device and an antiresonance frequency of the second displacing device in which a phase difference between a phase of a voltage of the second displacing device driving signal and a phase of a current flowing in the second displacing device is substantially constant.

10. (Canceled)

11. (Previously Presented) An actuator in accordance with claim 12, wherein a phase difference is provided between the driving signals in a manner so that a current flowing in the first displacing device has a predetermined phase difference with respect to a current flowing in the second displacing device.

12. (Previously Presented) An actuator comprising:

a first displacing device;

a second displacing device;

a compound member connected to top ends of the first displacing device and the second displacing device and for compounding displacements of the first displacing device and the second displacing device;

a driver for resonantly driving the displacing devices so as to move the compound member along an elliptic or a circular trail; and

current sensors respectively for sensing currents flowing in the first displacing device and the second displacing device,

wherein the driver drives the first displacing device and the second displacing device by driving signals respectively having a frequency included in a frequency band in the vicinity of resonance frequencies of the first displacing device and the second displacing device at which a displacement of the first displacing device is substantially the same as that of the second displacing device.

13. (Previously Presented) A method for driving an actuator which comprises a first displacing device, a second displacing device, and a compound member connected to top ends of the first displacing device and the second displacing device for compounding displacements of the first displacing device and the second displacing device, said method comprising the step of:

driving each of the first displacing device and the second displacing device in a manner so as to move the compound member along an elliptic or a circular trail by using a first displacing device driving signal and a second displacing device driving signal, respectively, each of the driving signals having a frequency that is between a first frequency and a second frequency,

wherein the first frequency is a higher one of a resonant frequency of the first displacing device and a resonant frequency of the second displacing device, and

wherein the second frequency is a lower one of an antiresonant frequency of the first displacing device and an antiresonant frequency of the second displacing device.

14. (Previously Presented) A method for driving an actuator which comprises a first displacing device, a second displacing device, and a compound member connected to top ends of the first displacing device and the second displacing device for compounding displacements of the first displacing device and the second displacing device, said method comprising the step of:

driving each of the first displacing device and the second displacing device in a manner so as to move the compound member along an elliptic or a circular trail by using a first displacing device driving signal and a second displacing device driving signal, respectively, each of the driving signals having a frequency included in an overlapped region of a first frequency band and a second frequency band,

wherein the first frequency band is defined as a region between a resonance frequency of the first displacing device and an antiresonance frequency of the first displacing device in which a phase difference between a phase of a voltage of the first displacing device driving signal and a phase of a current flowing in the first displacing device is substantially constant,

wherein the second frequency band is defined as a region between a resonance frequency of the second displacing device and an antiresonance frequency of the second displacing device in which a phase difference between a phase of a voltage of the second displacing device driving signal and a phase of a current flowing in the second displacing device is substantially constant,

wherein the frequency of the driving signals is a value at a center between a first frequency and a second frequency,

wherein the first frequency is a smaller one of the resonance frequencies of the first displacing device and the second displacing device, and

wherein the second frequency is a smaller one of the antiresonance frequencies of the first displacing device and the second displacing device.

15. (Previously Presented) A method for driving the actuator in accordance with claim 13, wherein the phase of the first displacing device driving signal has a phase difference with respect to the second displacing device driving signal.

16. (Previously Presented) A method for driving an actuator which comprises a first displacing device, a second displacing device, and a compound member connected to top ends of the first displacing device and the second displacing device for compounding displacements of the first displacing device and the second displacing device, said method comprising the step of:

driving each of the first displacing device and the second displacing device in a manner so as to move the compound member along an elliptic or a circular trail by using a first displacing device driving signal and a second displacing device driving signal, respectively, each of the driving signals having a frequency included in a frequency band in the vicinity of resonance frequencies of the first displacing device and the second displacing device at which a displacement of the first displacing device is substantially the same as that of the second displacing device; and

sensing a current flowing through the first displacing device and a current flowing through the second displacing device.

17. (Previously Presented) A method for driving the actuator in accordance with claim 16, further comprising the step of adjusting a phase difference between the first displacing device driving signal and the second displacing device driving signal so that the current flowing in the first displacing device has a predetermined phase difference with respect to the current flowing in the second displacing device.